

**DATABASE AND ANALYTICAL TOOL DEVELOPMENT
FOR THE MANAGEMENT OF DATA
DERIVED FROM US DOE (NETL) FUNDED
FINE PARTICULATE (PM_{2.5}) RESEARCH**

**SEMI-ANNUAL
TECHNICAL PROGRESS REPORT**



Submitted to:

U. S. Department of Energy
National Energy Technology Laboratory
Pittsburgh, PA 15236

DOE AWARD NUMBER: DE-FC26-02NT41476

DATABASE AND ANALYTICAL TOOL DEVELOPMENT FOR THE MANAGEMENT OF DATA DERIVED FROM US DOE (NETL) FUNDED FINE PARTICULATE (PM_{2.5}) RESEARCH

Semi-Annual Technical Progress Report

REPORT PERIOD START DATE: February 11, 2005

REPORT PERIOD END DATE: August 12, 2005

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DATE REPORT ISSUED: August 2005

DOE AWARD NUMBER: DE-FC26-02NT41476

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ABSTRACT

Advanced Technology Systems, Inc. (*ATS*) was contracted by the U. S. Department of Energy's National Energy Technology Laboratory (DOE-NETL) to develop a state-of-the-art, scalable and robust web-accessible database application to manage the extensive data sets resulting from the DOE-NETL-sponsored ambient air monitoring programs in the upper Ohio River valley region. The data management system was designed to include a web-based user interface that will allow easy access to the data by the scientific community, policy- and decision-makers, and other interested stakeholders, while providing detailed information on sampling, analytical and quality control parameters. In addition, the system will provide graphical analytical tools for displaying, analyzing and interpreting the air quality data. The system will also provide multiple report generation capabilities and easy-to-understand visualization formats that can be utilized by the media and public outreach/educational institutions. The project is being conducted in two phases. Phase One includes the following tasks: (1) data inventory/benchmarking, including the establishment of an external stakeholder group; (2) development of a data management system; (3) population of the database; (4) development of a web-based data retrieval system, and (5) establishment of an internal quality assurance/quality control system on data management. Phase Two, which is currently underway, involves the development of a platform for on-line data analysis. Phase Two includes the following tasks: (1) development of a sponsor and stakeholder/user website with extensive online analytical tools; (2) development of a public website; (3) incorporation of an extensive online help system into each website; and (4) incorporation of a graphical representation (mapping) system into each website. The project is now into its thirty-sixth month of development activities.

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EXECUTIVE SUMMARY

Advanced Technology Systems, Inc. (ATS) was contracted by the U. S. Department of Energy's National Energy Technology Laboratory (DOE-NETL) in August, 2002, to develop a state-of-the-art, scalable and robust web-accessible database application to manage the extensive data sets resulting from ambient air monitoring programs in the upper Ohio River valley region that have been sponsored by DOE-NETL.

Research projects sponsored by DOE-NETL collected large amounts of data on PM_{2.5} and other air pollutants at ambient monitoring sites in the upper Ohio River valley region between 1999 and 2003. Extensive monitoring sites have been operated by DOE-NETL and its contractors in Pittsburgh, PA (two (2) urban sites), Holbrook, PA (rural site), South Park, PA (suburban site), and Steubenville, OH. Less-extensive monitoring sites have been operated in six other locations in PA, OH and WV. The main objectives of the current effort are to gather the data from all these monitoring sites into a common database, and to develop analytical tools that will make the data easily accessible to researchers and the public via the Internet.

In addition to the data collected by DOE-NETL and its contractors, the database will include, to the greatest extent possible, ambient air data collected by other agencies in the upper Ohio River valley region, such as the U.S. EPA, Pennsylvania Department of Environmental Protection (PA-DEP), West Virginia Division of Environmental Protection (WV-DEP), Ohio EPA, and the Allegheny County Health Department (ACHD). Although emphasis is being placed on the upper Ohio River valley region, the database may also include data collected at other DOE-NETL sponsored sites outside the region, such as sites operated by the Tennessee Valley Authority in the Great Smokey Mountains and by the Southern Research Institute in North Birmingham, AL. The database and analytical tool development effort is also being coordinated, to the extent possible, with a similar effort by U.S. EPA to develop a relational database for data collected at its "PM Supersites". This coordination will ensure that the database and analytical tools produced under the DOE-NETL effort will be readily accessible to a wide variety of stakeholders.

The data management system will include a web-based user interface that will allow easy access to the data by the scientific community, policy- and decision-makers, and other interested stakeholders, while providing detailed information on sampling, analytical and quality control parameters. In addition, the system will provide graphical analytical tools for displaying, analyzing and interpreting the air quality data. The system will also provide multiple report generation capabilities and easy-to-understand visualization formats that can be utilized by the media and public outreach/educational institutions.

The project is being conducted in two phases. The entire project has been divided into ten primary tasks and those have been segmented into two primary phases. The project is currently in thirty-sixth month of development tasks and Phase Two began in August, 2003. Phase One consisted of design and specification tasks related to designing, implementing and populating the primary database that will house the collected data. Phase Two consists of tasks involving the design, implementation and testing of both website interfaces along with any analytical tools and features integrated into the project's websites.

I. INTRODUCTION

Advanced Technology Systems, Inc. (*ATS*) was contracted by the U. S. Department of Energy's National Energy Technology Laboratory (DOE-NETL) in August, 2002, to develop a state-of-the-art, scalable and robust web-accessible database application to manage the extensive data sets resulting from ambient air monitoring programs in the upper Ohio River valley region that have been sponsored by DOE-NETL.

Research projects sponsored by DOE-NETL collected large amounts of data on PM_{2.5} and other air pollutants at ambient monitoring sites in the upper Ohio River valley region between 1999 and 2003. Extensive monitoring sites have been operated by DOE-NETL and its contractors in Pittsburgh, PA (two (2) urban sites), Holbrook, PA (rural site), South Park, PA (suburban site), and Steubenville, OH. Less-extensive monitoring sites have been operated in six other locations in PA, OH and WV. The main objectives of the current effort are to gather the data from all these monitoring sites into a common database, and to develop analytical tools that will make the data easily accessible to researchers and the public via the Internet.

In addition to the data collected by DOE-NETL and its contractors, the database will include, to the greatest extent possible, ambient air data collected by other agencies in the upper Ohio River valley region, such as the U.S. EPA, Pennsylvania Department of Environmental Protection (PA-DEP), West Virginia Division of Environmental Protection (WV-DEP), Ohio EPA, and the Allegheny County Health Department (ACHD). Although emphasis is being placed on the upper Ohio River valley region, the database may also include data collected at other DOE-NETL sponsored sites outside the region, such as sites operated by the Tennessee Valley Authority in the Great Smokey Mountains and by the Southern Research Institute in North Birmingham, AL. The database and analytical tool development effort is also being coordinated, to the extent possible, with a similar effort by U.S. EPA to develop a relational database for data collected at its "PM Supersites". This coordination will ensure that the database and analytical tools produced under the DOE-NETL effort will be readily accessible to a wide variety of stakeholders.

The data management system will include a web-based user interface that will allow easy access to the data by the scientific community, policy- and decision-makers, and other interested stakeholders, while providing detailed information on sampling, analytical and quality control parameters. In addition, the system will provide graphical analytical tools for displaying, analyzing and interpreting the air quality data. The system will also provide multiple report generation capabilities and easy-to-understand visualization formats that can be utilized by the media and public outreach/educational institutions.

The project is being conducted in two phases. The project is now into its thirty-sixth month of development activities.

A. Project Goals and Objectives

The main objective of this database development effort is to gather the data, acquired from all these monitoring sites, into a common database, and develop analytical tools that will make the data easily accessible to researchers and the public via the Internet.

The proposed data management system will include a web-based user interface that will allow easy access to the data by the scientific community, policy- and decision-makers, and other interested stakeholders, while providing detailed information on sampling, analytical and quality control parameters. In addition, the system will provide graphical analytical tools for displaying, analyzing and interpreting the air quality data. The system will also provide multiple report generation capabilities and easy-to-understand visualization formats that can be utilized by the media and public outreach/educational institutions.

B. Project Phase Development

The project is being conducted in two phases. The first phase includes data inventory, benchmarking and database population tasks, as well as the development of data management architecture, a web-based retrieval system and an internal QA/QC system. A progress summary for Phase One is shown in table 1.

Task #	Description	Planned completed %	Actual completed %
1.1	Data Inventory/Benchmarking for Database Applications	100%	100%
1.2	Develop Data Management System Architecture	100%	100%
1.3	Population of Database	100%	96%
1.4	Develop Web-based Retrieval System	100%	99%
1.5	Develop Internal QA/QC System	N/A	N/A

Table 1 - Phase One Progress Summary

N/A – on-going activity.

The second project development phase is currently underway. The tasks involved in this phase include the development of a stakeholder-specific website, a publicly accessible website and an online help feature. This phase also includes the development of special analysis tools to provide a graphical representation of the data and a series of performance tests designed to provide the best possible data management solution.

A progress summary for Phase Two is shown in table 2.

Task #	Description	Planned completed %	Actual completed %
2.1	Develop Stakeholder Website	100%	90%
2.2	Develop Public Website	100%	75%
2.3	Develop Online Help Feature	100%	15%
2.4	Provide Graphical Representation of Data	100%	85%
2.5	Performance Test	100%	40%

Table 2 - Phase Two Progress Summary

II. EXPERIMENTAL

A. Phase One Tasks

Task 1.1 – Data Benchmarking/Inventory for Database Applications

Any database application development effort requires some knowledge of the types and number of data contained in the resulting database. In addition to knowing this information, it is also wise to investigate or benchmark existing applications and development efforts that are similar in design or nature as the application being developed. Therefore, *ATS* proposed to conduct benchmarking investigations of existing projects, activities and applications prior to embarking on this project, as well as evaluate and quantify the data destined for usage with this application.

Several items were described in detail within the first, second and third Semi-Annual Technical Reports for this project. Those included the CARB Data Management Project in California and the EPA Supersite Database Development Project.

Task 1.2 - Develop Data Management System Architecture

The first semi-annual technical report contains detailed information regarding the design of the data management system architecture. To summarize, a system has been developed using MS SQL Server 2000 Enterprise Edition, MS Windows 2000 Advanced Server and external hardware, to provide the data management system architecture for this project.

A series of database objects and scripts have been constructed to ease all software development tasks and to accommodate expansion of the system to accommodate more users and data. The second semi-annual technical report contains detailed descriptions of *stored procedures*, or static queries that are stored within the database structure.

Additional changes to the Data Management System Architecture have been made to accommodate additional features such as our Geographic Information Systems (GIS) site selection tools and to improve the overall performance of the data structure.

The Data Management System Architecture design is complete and has been implemented for this project. Additions and changes to stored procedures are made as required, but these changes do not significantly impact the overall design and function of this architecture.

Task 1.3 - Population of Database

As stated in previous reports, data has already been populated by using a series of conversion scripts and data processing utilities to *pre-process*, or re-format the supplied data source files into application-specific formats, and a special application, the *PM Data Imports Utility*, was developed and used to create specialized data mappings and import a large amount of data received from Desert Research Institute (DRI). These specialized data mappings involve the mapping of DRI parameters to NARSTO parameters and sometimes involve creating new parameter records for items such as ‘Strong Acidity’ which equates an acidity level equivalent to levels of H₂SO₄, or Sulfuric Acid.

During an intensive week of combined efforts between project team members, data obtained from the Pittsburgh Air Quality Study (PAQS), provided by researchers at Carnegie Mellon University (CMU), was added to the database. This data included a total of sixty-six (66) source

files, containing data for ninety-seven (97) different parameters, for a total of one million, three hundred and sixteen thousand, eight hundred and ninety-four (1,316,894) new data records. Table 3 details the types and quantity of data imported. All of the PAQS observation records, with the exception of the *Single Particle* data, have been imported into the project database.

Type	Num. Files	Records	Parameters
CONT_OCEC	1	5122	2
CONT_VOC	2	42801	33
DENUDED_ORGANIC	1	336	4
DICHOT	1	754	2
FILTER_INORGANIC	2	2520	5
FILTER_OCEC	1	2064	4
FOG	2	104	13
FRM	1	404	2
MOUDI_MASS	1	3555	2
NEPH	1	25152	3
PEROX	4	29220	3
STEAM_IC	5	33048	6
SURF-CONT-SO4-NO3	14	122976	2
GAS-TEOM	14	368928	6
SURF-MET-DATA	16	679910	10
TOTAL	66	1316894	

Table 3 - Imported PAQS data

TEOM data and data obtained from the Environmental Protection Agency (EPA) for data collection sites in Pennsylvania, Ohio, West Virginia and Kentucky have all been imported into the database. For these datasets, the project team utilized Data Transformation Services (DTS) scripts to automate the population of the database and accommodate the inclusion of additional datasets in the same format.

There is one remaining primary dataset not present in the database at this time. This is data collected by the Steubenville Comprehensive Air Monitoring Program (SCAMP) sites, which has not yet been received by the project team.

Task 1.4 - Develop Web-Based Retrieval System

Once the data is transferred to the database, users specify which data is to be retrieved through the Query Builder Interface. This interface provides resulting datasets in a tabular format and saves the query parameters for retrieval by the analysis tools. Static datasets are also provided via HTTP protocol and users complete a criteria selection process to download the original data files. Previous Semi-Annual Technical Reports have detailed both the static data downloads controls and the dynamic query systems. In the past six months, development efforts have primarily been focused on extending and improving the existing web-based data retrieval controls, discussed in detail in previous reports. All of this work has occurred at the code-engine level and no visible changes to the user interface have resulted from this work.

Task 1.5 - Develop QA/QC System

The Quality Assurance/Quality Control (QA/QC) standards and processes established for this application provide for multiple layers of quality control. It is important to remember that the standards and processes mentioned in this document do not examine the quality of the data submitted, but rather ensure that the data entering the database is the same data provided by the submitting authority. Previous semi-annual technical reports detail the automation techniques used to verify data integrity during the database population processes.

In addition to verifying the data, the internal QA/QC system also allows for testing the website's integrity and functionality. Part of this scrutiny has resulted in the fixing of erroneous contact information and data inventory errors on the website.

The QA/QC process is an on-going exercise.

B. Phase Two Tasks

Task 2.1 - Develop Stakeholder Website

As proposed by *ATS*, each stakeholder will have access to the entire data analysis package while the general public will have access to selected features through the public website described in Task 2.2. The stakeholder website will provide the ability to view and develop graphical representation of the digital data online for reports and for data analysis. The data analysis package will be an interactive tool that will be embedded in the data warehouse and repository. The querying of the data permits user-defined access and review of the data. Built-in online analytical tools for advanced data analysis have been provided with the following options:

- Dynamic/interactive charting capabilities – online graphing of the data in user-defined formats
- Trend analysis – time series of pollutant data – by species, monitor and region
- Statistical analysis of pollutant profiles and distributions
- Back trajectory analysis
- Speciation filter composition analysis

Development efforts are also underway to test and potentially add the following options to this list:

- Online point source modeling capabilities
- Multi dimensional plotting capabilities (three dimensions in space (x, y, z), and time)
- Meteorological evaluations (influence on air pollutant concentrations)

The stakeholder website is being developed using Microsoft Visual Studio .NET, in conjunction with Microsoft Internet Information Services (IIS), Microsoft SQL Server 2000 and the .NET framework (a packaged addition for MS Windows 2000 or XP). The project team decided to utilize the .NET framework early in the planning stages of this project because of the extensive tool sets available for this platform and the tight integration of XML Web Services into the product. XML Web Services allow remote users to retrieve datasets locally, combine multiple data sources into a single dataset and exchange data with other datasets that may, or may not, be directly related to the PM_{2.5} data.

As part of the development process, the project team continues to engage stakeholders to provide critical feedback so the development team can create *meaningful* and *useful* analysis tools. As stated in previous reports, a series of web casts have been conducted, with more planned for the near future, and the capabilities and potential for this web-based application are presented and discussed at these forums.

Additionally, the project team has also taken the project *on-the-road* and made presentations about the project, including live demonstrations, to researchers attending several relevant conferences and seminars. The latest conference attended by the project team members was the CREST-RESSACA conference held in San Antonio, Texas from April 12 through April 15, 2005. The project team spread awareness of the project and solicited input for improvements to both the data retrieval and data analysis tools.

Task 2.2 - Develop Public Website

ATS proposed to construct a separate website connected to the data archive for public outreach, providing the citizens of the upper Ohio River valley and at-large, along with legislative and regulatory authorities, a resource and an educational tool highlighting the extensive monitoring programs undertaken by NETL. Publicly accessible sections of the database application's web space will be available to everyone without log in. This portal will be different from the one for stakeholders, sponsors and developers, which will require registered users to submit a username and password combination before access to the restricted website is granted.

This interactive web-based application will be the backbone of the public outreach system. The web delivery system will be designed as an information/decision support center and an educational tool. The system will provide clear and concise data summaries from the monitoring programs and will include easy-to-understand graphical representation of the data including spatial and temporal mapping of the data accompanied by the online help as described in Task 2.3. To insure that the website will deliver information in a clear and concise manner, the deliverables of this task will be reviewed continuously by environmental and community representatives from the region prior to launching.

To date, we have developed a preliminary version of the public website which was used by DOE-NETL to advertise data availability and included a data retrieval tool to download the original data files associated with this project.

Task 2.3 - Develop Online Help Feature

ATS proposed to construct an online help feature, in conjunction with the web-based application, and it will be developed to support both the sponsor/stakeholder and the public sections website. The online help and instruction component of the application will be an interactive system that will give depth, understanding and context to the environmental data presented. The online help will assist the user at any level of scientific background (novice to professional) in the interpretation of the data. The online help will provide assistance on the following general topics:

- Definitions that will provide clear explanations of the terminology used in evaluating air pollutants
- Explanation of the Federal and State Regulations pertaining to criteria pollutants
- Background information on atmospheric chemistry, transport and emissions of air pollutants

- Effects of meteorology on air pollution episodes
- Significance of the data as it relates to public health
- Information on community-based efforts that can impact ambient air pollution levels
- Navigation of the website itself

Task 2.4 - Provide Graphical Representation of Data

The graphing and analysis tools for this project have been developed with ChartFX for .NET graphing and charting controls using the C# .NET Web Forms environment. ChartFX for .NET graphing and charting controls generate all the graphs on the server and generate downloadable image files from a cached dataset on the MS SQL server.

Previous reports detailed several analysis tools used to graphically represent selected datasets:

1. data calculation tool, shown in Figure 3
2. time series plots, shown in Figure 4
3. box-whisker plots, shown in Figure 5
4. frequency histograms, shown in Figure 6
5. site comparison graphs using scatter plots, shown in Figure 7
6. filter composition tool, shown in Figure 8



The screenshot shows a web form titled "Data Options" with a blue header bar. It contains three main sections: "Select Site" with a dropdown menu showing "Lawrenceville Primary"; "Select Parameter" with a dropdown menu showing "PM2.5 Filter-Mass [Filter+denuder] - Duration: 24 hour"; and "Calculation Type" with four radio button options: "1-hr Max", "8-hr Average", "24-hr Average" (which is selected), and "Monthly Average".

Figure 1 - Data Calculation Tool

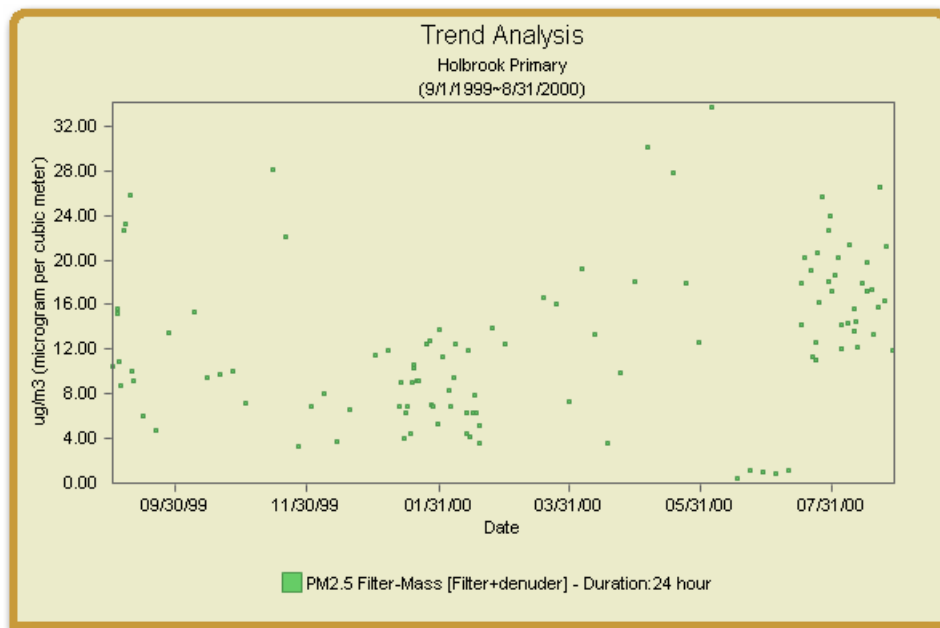


Figure 2 - Time Series Plots

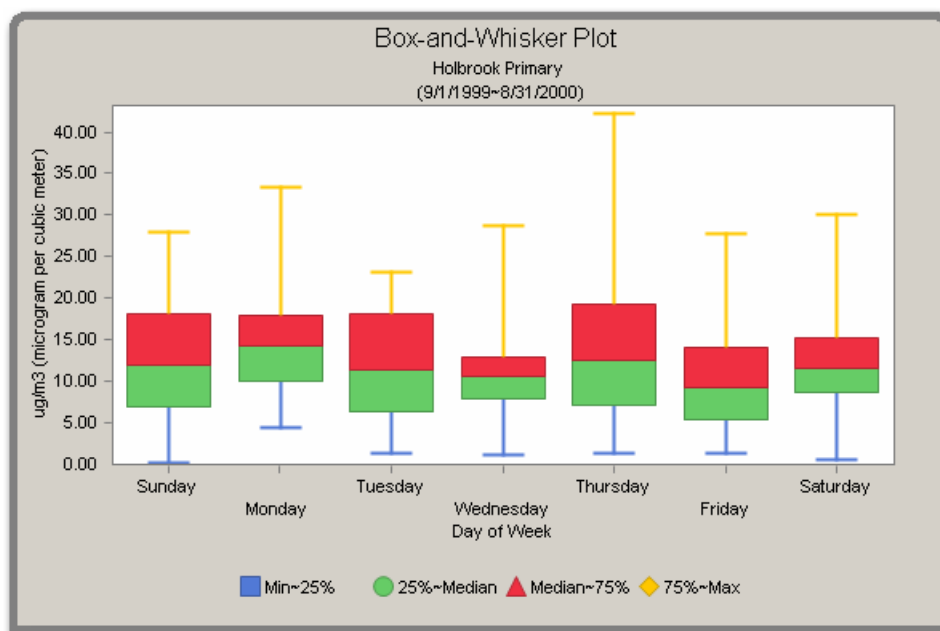


Figure 3 - Box-Whisker Plots

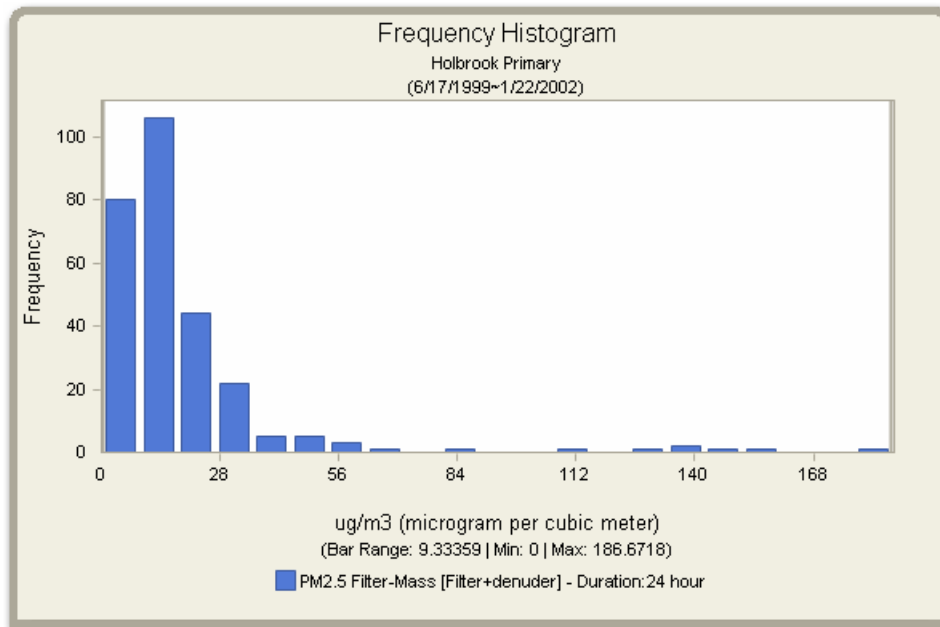


Figure 4 - Frequency Histograms

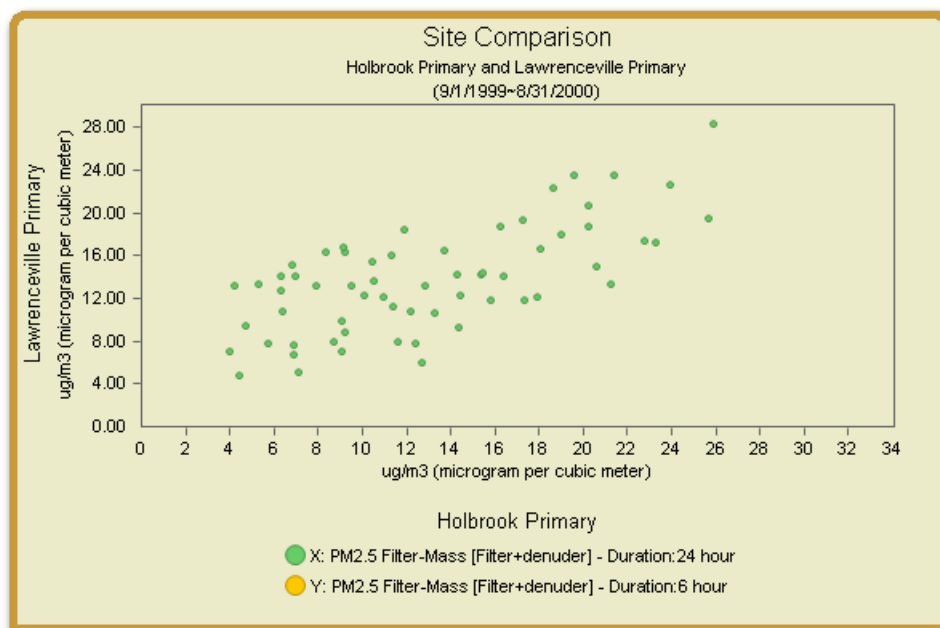


Figure 5 - Site Comparison Graphs

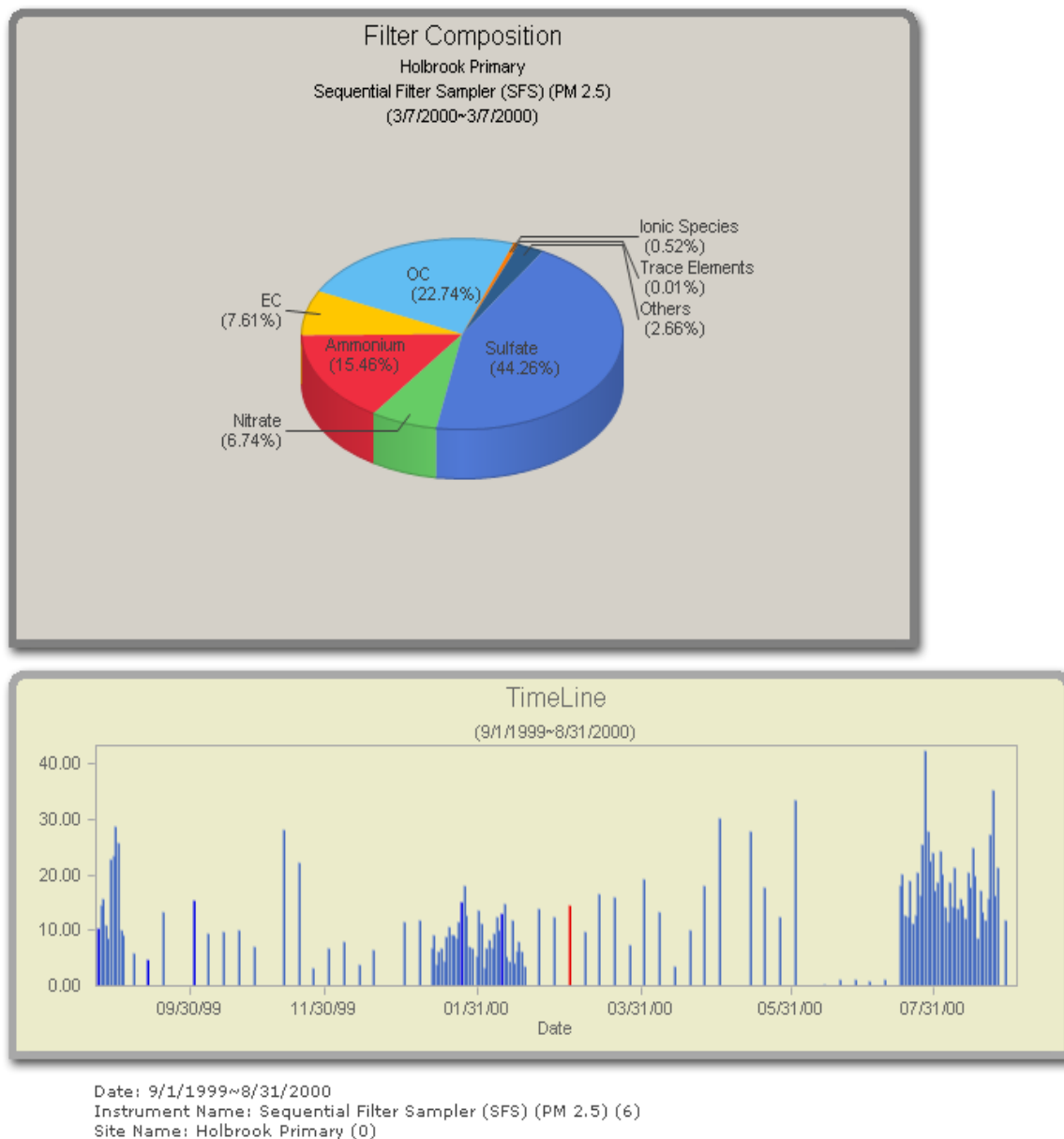


Figure 6 - Speciation Filter Composition Tool with Timeline Control

Work continues to improve the trajectory and cluster analysis tools, shown in Figures 7 and 9 and mentioned in previous reports. These tools require the use of pre-compiled trajectory data for each data collection site. The query operations used to develop a user-requested trajectory or cluster analysis are very intensive and require refinement before general usage is advisable.

Future efforts will focus on refining and improving the trajectory data query processes and user response times to prevent server timeout errors from occurring.

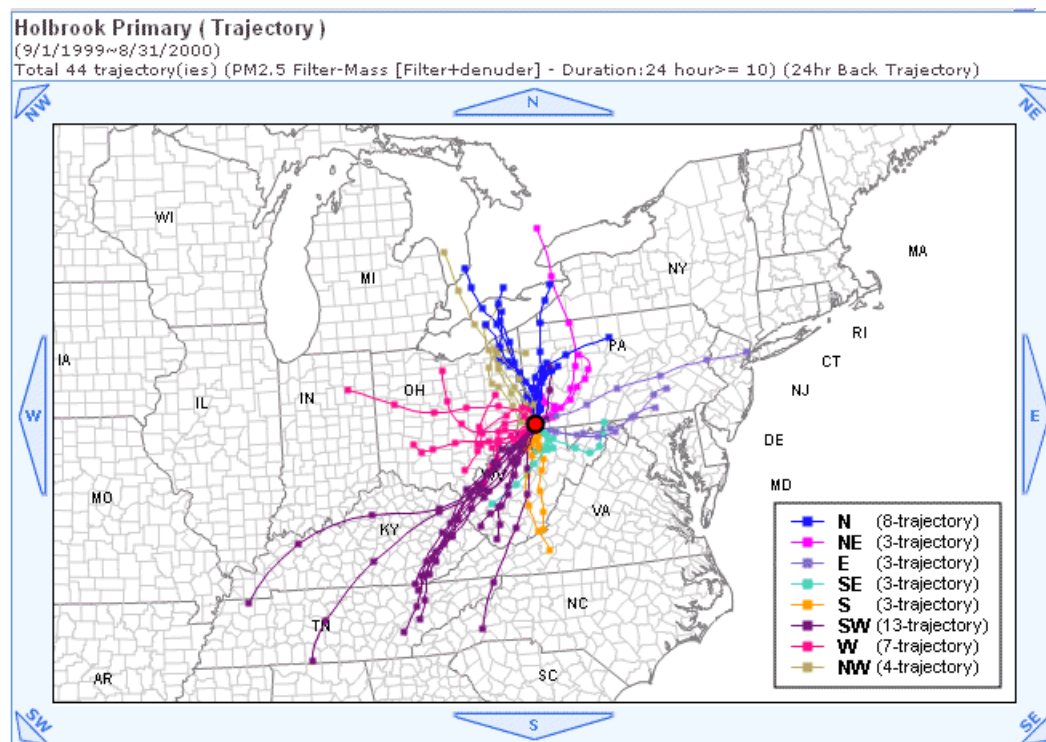


Figure 7 – Sample Trajectory Map

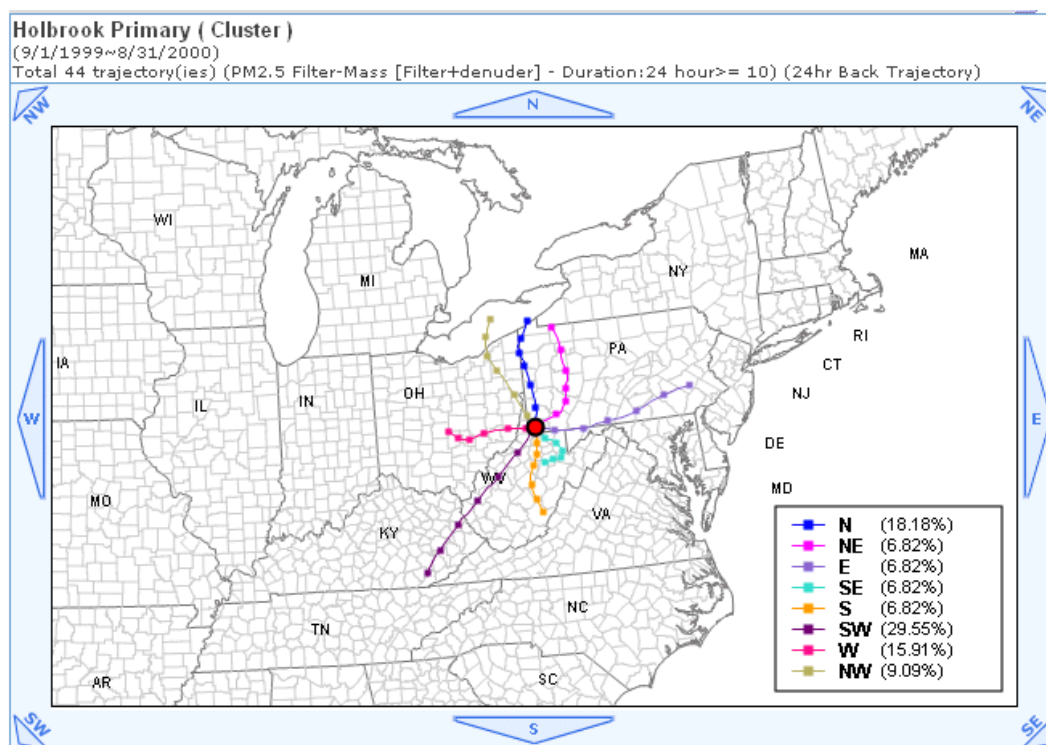


Figure 8 - Sample Cluster Analysis Map

Task 2.5 - Performance Testing

ATS, in coordination with all members of the external stakeholder group, will conduct a detailed testing program for the resulting application to verify the functionality and proper execution of all portions of this application. This testing program will provide for interactive user feedback, discussion forums and periodic email notifications and announcements. This testing program will help insure that the intended objectives of this project are met or exceeded. This effort requires revisiting and reworking some of the original designs, and consequently, will be an ongoing exercise in Phase Two of this project.

A section of the stakeholder website will be dedicated for posting of feedback from beta-testers of this application. Web cast participants are being asked to participate in the beta-testing phases of development and links to the applications have been provided to researchers upon request.

III. RESULTS AND DISCUSSION

The first phase includes data inventory, benchmarking and database population tasks, as well as the development of data management architecture, a web-based retrieval system and an internal QA/QC system. A progress summary for Phase One is shown in Table 3:

Task #	Description	Planned completed %	Actual completed %
1.1	Data Inventory/Benchmarking for Database Applications	100%	100%
1.2	Develop Data Management System Architecture	100%	100%
1.3	Population of Database	100%	96%
1.4	Develop Web-based Retrieval System	100%	99%
1.5	Develop Internal QA/QC System	N/A	N/A

Table 4 - Phase One Progress Summary

N/A – on-going activity.

The tasks involved in the Phase Two of this project include the development of a stakeholder-specific website, a publicly accessible website and an online help feature. This phase also includes the development of special analysis tools to provide a graphical representation of the data and, of course, a series of performance tests designed to provide the best possible data management solution. A progress summary for Phase Two is shown in Table 4.

Task #	Description	Planned completed %	Actual completed %
2.1	Develop Stakeholder Website	100%	90%
2.2	Develop Public Website	100%	75%
2.3	Develop Online Help Feature	100%	15%
2.4	Provide Graphical Representation of Data	100%	85%
2.5	Performance Test	100%	40%

Table 5 - Phase Two Progress Summary

IV. CONCLUSION

The development efforts have so far proceeded as expected. Some target milestones have not been met primarily due to delays in acquiring input data from third party sources.

This is especially so with the data inventory task, where data reformatting issues have also been encountered. Delays have also been an inevitable consequence of the philosophy of the DOE COR and the project team to proceed very carefully and deliberately with the development of the stakeholder website. It is believed that the ultimate success of this project will require a high degree of stakeholder confidence and subsequent participation in the website development process, and that such participation will be greatly enhanced if stakeholders are presented with a relatively “polished” product at the outset. Therefore, the extra programming effort has been dedicated toward developing and refining a limited set of fully-functional graphic and analytical routines

(e.g., time series analysis and box plots) before fully pursuing a potentially expensive program of stakeholder engagement. The DOE COR has also been actively involved in an on-going evaluation and β -testing of the developing website and analytical tools, providing critical feedback that has been instrumental in modifications that have made the application more user-friendly and the navigation much more dynamic.

The hurdles encountered, however, have not been insurmountable, as other parts of the project have proceeded as proposed. Since the level of effort associated with the slowed tasks is still the same, the costs to complete this task will not be impacted either negatively or positively. The project is currently proceeding on, a no-cost time extension through August 2006..

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VI. BIBLIOGRAPHY

Not applicable.

VII. LIST OF TERMS, ACRONYMS AND ABBREVIATIONS

Term	Definition
Admin Level	Security level indicating the degree of access a specific user possesses to administration utilities and data.
ACHD	Allegheny County Health Department
APM	Automated Population Module
Application Account	An application account (Windows 2000). This account is created and edited using Windows 2000.
Application Administrator	An individual responsible for managing application performance, user access and newsletter/announcement notification services.
Browse Level	Security level indicating the areas of the application and datasets that a specific user can 'browse' through.
Cached Data	Data retained at the server level to serve frequently polled data. These datasets are cached, or stored, at the server and reduce query loads on the database server, thus increasing overall efficiency and application response time.
CARB	California Air Resources Board
CSV	Comma Separated Value
Data Administrator	An individual responsible for managing the database housing the PM data, as well as managing all assigned data submission accounts.
Data Submitter	Individual user who has permission to submit data for inclusion in the PM database.
DOE-NETL	US Department of Energy's National Energy Technology Laboratory
Foreign Key	A non-negative whole number used to reference a data row in a related table.
FTP	File Transfer Protocol.
GIS	Geographic Information Systems
GMT Offset	Number of hours that, when added to the local time values, provides GMT Time values; e.g. 11:00AM local time, with a GMT offset value of -5 means that the GMT time value for this local time value would be 6:00AM GMT.

HTTP	Hypertext Transfer Protocol
Media	Filter used to collect speciation samples.
Metaflag	Localized flagging system specific to a particular submitting authority.
Method	Descriptive text that describes how data was collected.
NARSTO	An acronym for "North American Research Strategy for Tropospheric Ozone." A tri-national, public-private partnership for dealing with multiple features of tropospheric pollution, including ozone and suspended particulate matter.
NARSTO Metaflag	Standardized flagging system (NARSTO). Each metaflag is mapped to a NARSTO metaflag to provide meaningful results when querying across datasets originating from multiple submitting authorities.
NOAA	National Oceanic and Atmospheric Administration
PA-DEP	Pennsylvania Department of Environmental Protection
Parameter	A concatenated descriptive definition of what the observation value represents. Components of a valid parameter include: parameter property, parameter identifier, collection principle, and parameter source.
Parameter Identifier	Descriptive text that identifies a chemical property of a parameter.
Parameter Property	Descriptive text that identifies a physical property of a parameter.
Primary Key	Unique non-negative whole number used to reference each row in a database table. This is used to identify relationships between related items in related tables.
Parameter Source	Originating organization for parameter codes and descriptions.
QA/QC	Quality Assurance / Quality Control
QC Status	Quality control status code.
Read Level	Security level indicating the areas of the application and datasets to which a specific user has read access.
Sample Duration	Text describing the sample duration that is used to collect a specific sample. This usually applies only to filter data; sample duration of H12 indicates that the sample in question was taken over a 12-hour period.

Sample Frequency	Text describing the sample frequency, or interval, between regular readings; e.g. M15 indicates that a sample is taken every 15 minutes.
SQL	Structured Query Language
Subscriber	Individual user who has elected to receive email notification from pmdata.org.
System Account	A Windows 2000 Server account used to administer the network and/or application servers.
Systems Administrator	An individual responsible for managing the hardware and operating system(s) of the hosting computers and networks. This person ensures that the application and database is available to users and works to correct any connectivity issues that may occur.
User Account	Application account established for each user that contains each user's contact data and security profile.
US EPA	US Environmental Protection Agency
VCard	Virtual address card. This is similar to a rolodex entry, containing an address, city, state and zip code. A VCard can link to multiple entities sharing the same physical address. Entries also contain a location's county and country.
Write Level	Security level indicating the areas of the application and datasets to which a specific user may enter new records or modify existing records.
WV-DEP	West Virginia Department of Environmental Protection
XML	Extensible Markup Language